UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/807,158	05/15/2001	Hermann Diehl	U013268-7	3157

7590 03/31/2003

Ladas & Parry
26 West 61st Street
New York, NY 10023

EXAMINER
LUU, THANH X

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 03/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Offic Action Summary	Application No.	Applicant(s)	
	09/807,158	DIEHL ET AL.	
	Examiner	Art Unit	
	Thanh X Luu	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-24 and 31-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-24 and 31-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 May 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to amendments and remarks filed December 12, 2002. Claims 18-24 and 31-36 are currently pending.

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: page 6 of the specification, in the paragraph starting with the terms "The aperture for earth observation is a small aperture," mentions "window 8" which could not be found in Figure 1; Figure 2 shows "8" as a beamsplitter. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 18-24 and 36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 18-24 and 36, it is unclear what a "means for variable control of exposure time... based on the brightness of the earth and stars" consists of. Page 3 states "[t]he sensor allows variable control of the exposure time." Page 7 simply states that "suitable control of exposure time" is carried out. However, the specification does

not mention any structure or circuit that acts to variably control the exposure time of the sensor based on the brightness of the earth and the stars. Examiner invites Applicant to cite equivalent structure or circuitry mentioned in the specification that corresponds to the means plus function limitation.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> **(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.**

5. Claims 18-24 and 36, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Falbel (U.S. Patent 5,189,295) in view of the Japanese publication of Muranaka (JP 5-052549, published March 2, 1993).

Regarding claims 18, 20-22 and 24, Falbel discloses (see Figure 3) a combined earth-star sensor system for three-axis attitude determination of a satellite in space, the system comprising: separate apertures (at 16 and 36) with different directions of observation of earth (to earth) and stars (to polaris) and common image pickup devices (pixels in 10) for the earth observation and the star observation. Falbel further discloses (see Figure 3) an optical arrangement (38) for earth observation and an optical arrangement (40) for star observation and a semitranslucent beam splitter (36) between the apertures and the optical arrangements for deviating laterally entering light from the earth and transmitting light from the star, to the image pickup devices. Falbel also discloses (see Figure 3) the light from the star travels longitudinally to the optical

arrangement (40) for star observation. Falbel further discloses (see Figure 3) the aperture for light from the earth (16) is considerably smaller than the aperture for light from the star (40). Falbel does not specifically disclose a means for variable control of exposure time of earth and star observations based on a brightness being observed. Muranaka teaches (see translated abstract) a star and earth sensor having a means for varying the exposure time (3, 4) based on the brightness being observed. Muranaka recognizes that improved detection can be achieved by varying the exposure time based on brightness. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a means for varying the exposure time as claimed in the apparatus of Falbel in view of Muranaka to improve detection by reducing detection error as taught.

Regarding claims 19 and 23, Falbel in view of Muranaka disclose the claimed invention as set forth above. Falbel also discloses (see Figure 1) a common optical arrangement (14) for earth and star observation and a deflection mirror (18). Falbel further discloses (see Figure 1) the aperture for light from the earth (16) is considerably smaller than the aperture for light from the star (at 34 degrees). Falbel does not specifically the deflection mirror reflecting of laterally entering light from the earth to the common optical arrangement. However, the choice between which light is reflected and which light is transmitted would require only routine skill in the art. Further, Falbel teaches in another embodiment (see Figure 3) having light from the earth laterally reflected. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the light from the earth laterally reflect off the deflection

mirror of Falbel in view of Frame et al. to further reduce the higher intensity light from the earth and improve star detection.

Regarding claim 36, Falbel in view of Muranaka disclose the claimed invention as set forth above. Falbel and Muranaka do not specifically disclose light from the stars being produced on long duration image frames and light from the earth being produced on short duration frames. However, it is notoriously well known in the art that light from stars is dimmer than light from the earth. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a longer exposure time for stars than the earth in the apparatus of Falbel in view of Muranaka to better detect the dimmer light.

6. Claims 31-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Falbel in view of Billing-Ross et al. (U.S. Patent 5,319,969) and Muranaka.

Regarding claims 31 and 32, Falbel discloses (see Figures 1-3) a method of simultaneous orbit determination and attitude determination of a space vehicle, comprising: simultaneously forming images of a star (polaris) and the rim of the earth (see column 2, line 56, "crescent") in one focal plane (at 10) of a sensor system; determining attitude of the star in the focal plane (see column 3, lines 15-25); determining the rim of the earth by image processing (see column 4, lines 33-39); and calculating at least one of orbit or attitude of the space vehicle (see Figure 4, pitch, roll, yaw). Falbel also discloses (see column 3, line 17) an evaluation system of the sensor system operates by including a star catalog (ephemeris data), disregarding areas in the image of the rim of the earth of star images superimposed on the earth image (column

4, lines 33-39) as claimed. Falbel does not specifically disclose determining rates of rotation. Billing-Ross et al. teach (see column 4, lines 40-48) using movement of stars to determine rates of rotation. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to determine rates of rotation through observing the movement of the star in the method of Falbel in view of Billing-Ross et al. to provide additional data on the space vehicle to more accurately track it. Falbel also does not specifically disclose adapting exposure time based on the difference in brightness. Muranaka teaches (see translated abstract) a star sensor having a means for varying the exposure time (3, 4) based on the brightness being observed. Muranaka further recognizes that improved detection can be achieved by varying the exposure time based on brightness. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to alternate the exposure time as claimed in the method of Falbel in view of Billing-Ross et al. and Muranaka to further improve detection by reducing detection error as taught.

Regarding claims 33 and 35, Falbel in view of Billing-Ross et al. and Muranaka disclose the invention as set forth above. Falbel does not specifically disclose tracking the rim of the earth using models or determining the rim based on earth models. Billing-Ross et al. teach (see column 6, lines 1-15) determining satellite orientation based on comparing limb (earth) images with limb models. Since the orientation of the satellite is determined by using earth models, the orientation of the rim of the earth is subsequently tracked as well. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to track the rim of the earth using models in the

method of Falbel in view of Billing-Ross et al. and Muranaka to more accurately obtain positional information of the space vehicle. Further, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use earth models to determine the rim of the earth in the method of Falbel in view of Billing-Ross et al. and Muranaka to further verify the detection of the rim and improve the accuracy of detection.

Regarding claim 34, Falbel in view of Billing-Ross et al. and Muranaka disclose the invention as set forth above. Falbel does not specifically disclose filtering long wave radiation. However, it is notoriously well known in the art that all types of radiation are present in space and filters allow for the reduction or isolation of any desired radiation. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to filter out long wave fraction of radiation used for determining the rim of the earth in the method of Falbel in view of Billing-Ross et al. and Muranaka to reduce long wave radiation or isolate long wave radiation to improve rim detection.

Response to Arguments

7. Applicant's arguments with respect to claims 18-24 and 31-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh X. Luu whose telephone number is (703) 305-0539. The examiner can normally be reached on Monday-Friday from 6:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta, can be reached on (703) 308-4852. The fax phone number for the organization where the application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

txl
March 20, 2003

Thanh X. Luu
Patent Examiner